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PNEUMOCOCCAL BRONCHIOLITIS (CAPILLARY BRONCHITIS).*

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WHETHER capillary bronchitis constitutes a distinct affection is still a mooted question. Some authors hold that it is so closely related to tracheobronchitis or to bronchopneumonia that it should not be considered a separate disease, and others maintain that it is an established entity with a clinical as well as pathological basis.

Austin Flint¹ objected to the term because "the bronchial branches of small size, but not the smallest, are affected in so-called capillary bronchitis." Loomis and Thompson² maintain that "the capillary tubes are no longer regarded as the seat of a catarrhal inflammation which can with propriety be termed a capillary bronchitis as a pathological entity, since the process cannot extend to the terminal bronchioles without a corresponding lobular involvement." Many years ago Morrill³ remarked that the employment of the term "capillary bronchitis" to describe a distinct and independent disease had diminished, and that "the space allotted to it in the writings of the best authorities has been abridged." Christopher⁴ believes that this affection is always associated with bronchopneumonia, and that it does not exist as an independent affection. Hoffmann⁵ states that it is not separated from the simple acute tracheobronchitis by any sharp boundary line, and that the latter, if extensive, is always associated with the former. Osler⁶ considers the condition merely an early stage of bronchopneumonia, and he states that inflammation of the capillary bronchi rarely, if ever, exists without involvement of the lobular structure.

But opposite views are not wanting. Ewart⁷ believes that capillary bronchitis is a distinct disease, and that the occurrence of a bronchopneumonia is not inevitable, death occurring before

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consolidation appears, or the tendency being rather "to peribronchitis, to purulent infiltration of the bronchi, and to dilation, than to consolidation." Stewart and Gibson,⁸ J. M. Patton,⁹ Fowler and Godlee,¹⁰ Powell,¹¹ and Samuel West,¹² in recent publications, class this as a separate affection. According to West, capillary bronchitis has been established as a special disease both by clinical and pathological evidence, and it differs from bronchopneumonia in that the former is secondary to a tracheo-bronchitis, the latter being of acute onset without a previous bronchitis.

Doubtless the close relationship between this disease and bronchopneumonia accounts for the fact that the former resembles the latter in being primarily a disease of infants and the aged. Ewart states that it is "shared exclusively by the earliest and latest stages of life;" Fowler and Godlee, that when it occurs in mid-adult life it is among alcoholics and obese subjects.

Capillary bronchitis is considered by Duflocq and Ménétrier,¹³ Marfan,¹⁴ West, and others to be an infectious disease, and Duflocq¹⁵ and Ritchie¹⁶ report cases substantiating their opinion. Just as in tracheobronchitis, here also the most frequent organisms present are the pneumococcus and streptococcus.

That there may occur, in an adult, an inflammation, practically limited to small bronchi, is established by the following case.

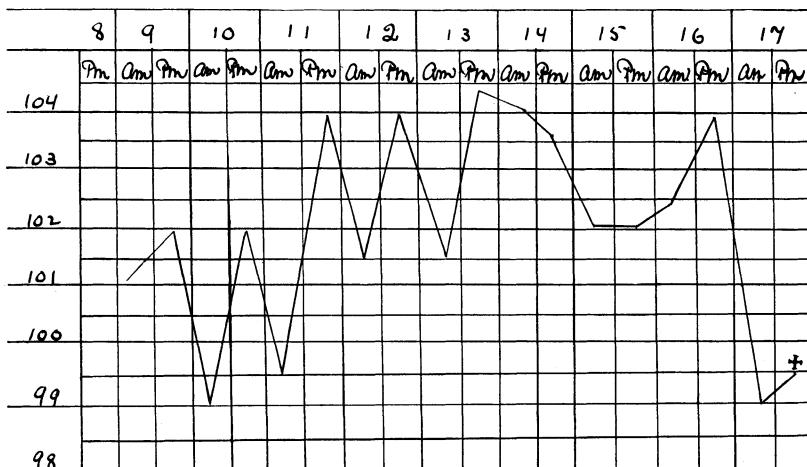
Abstract of the clinical record: Peter Damades, a Greek laborer, twenty-one years of age, was admitted to the Cook County Hospital to the service of Dr. E. F. Wells, April 8, 1903. The patient could not speak English, and the previous history was not obtained.

Examination showed a well-nourished young man, who perspired freely and coughed incessantly, raising a white expectoration. There was neither discomfort nor distress. The tongue was coated, and the pharynx, larynx, tonsils, and uvula were dusky red.

Externally the chest showed no changes, and the respiration was easy. Vocal fremitus was normal, and the movements on both sides were regular. Normal pulmonary resonance was obtained over the entire chest. Crepitant and subcrepitant rales

were heard below the third rib, anteriorly and posteriorly. The vocal sounds were unaltered, and tubular breathing was absent. The heart was normal in position, but the first sound at the apex was roughened. The spleen was not palpable. The sputum contained no tubercle bacilli, but diplococci and short bacilli. The urine was normal. There was a leucocytosis of 15,000.

The temperature on entrance was 101° F. The fever of onset was that of a gradual invasion, reaching a maximum height of 104.6 F. on the sixth day. Subsequently the temperature fell



TEMPERATURE CURVE.

and did not again reach its former height. It is noteworthy that during the last five days the course of the fever was in all respects similar to that of lobular pneumonia, the drop of 4.6 which occurred on the last day closely resembling a crisis (see curve).

The pulse and respiration were irregular, the former during the last few days ranging between 120 and 160; the latter, between 40 and 55.

On the tenth day after entrance the patient became delirious, ran into the corridor, and died soon afterward.*

The clinical diagnosis was pneumonia, probably associated with miliary tuberculosis.

The anatomical diagnosis (Dr. E. R. LeCount): bilateral dif-

*This is not an infrequent form of death in lobar pneumonia.

fuse bronchitis, bronchopneumonia (minimum degree), acute swelling of mediastinal and tracheobronchial glands, acute splenitis, hyperemia of the kidneys, hypertrophy of the heart, perisplenitis, miliary gummata (?) of the liver.

The great resemblance which the lesions of the lungs bore to tubercles was responsible for an anatomical diagnosis of general miliary tuberculosis of hematogenous type affecting both lungs. The subsequent histological examination, however, proved this diagnosis to be erroneous.

The main interest centers in the lungs, and the following brief description of them is taken from the record:

Combined weight of the lungs—1,780 g. The pleura of the right lung is glistening, and the margins are prominent. The lung is dark red, and the pleura quite free from coal pigment. The vessels are engorged. At one point externally there is a calcified area with a yellow center. On the posterior and diaphragmatic surfaces are found granular, projecting nodules. There are no adhesions between the lobes.

On the cut surface are seen disseminated white spots, not distinctly demarcated. These small pale areas of consolidation resemble miliary tubercles in all respects, except that they are not so sharply defined at the margins, coalescing gradually with the surrounding tissue. They are absent from the pleura, but are scattered throughout the lung quite uniformly, and in appearance are somewhat granular. One region of diffuse consolidation, as large as the finger nail, occurs in the upper lobe. It is granular and gray on the fresh surface. A yellow mucopurulent material exudes from the cut bronchi.

The left lung differs from the right only in the presence of a small amount of fibrous adhesion at the apex of the fissure, and a small area of atelectasis at the lower margin. Scattered throughout all the lobes granular areas similar to those in the right lung are found.

The tracheobronchial glands are enlarged. There is a large mass of them at the bifurcation of the trachea. They are soft, and the cut surface is moist and dark red. Several of the largest ones weigh together 200 g.

Bacterial examination.—The diplococcus *lanceolatus* was obtained in pure culture from the lungs and lymph glands. Cover-slip preparations showed this to be the sole organism present. It was encapsulated and stained by Gram's method. Cultures from the spleen and pericardial fluid remained sterile. A pure bouillon culture of the organism was injected into the peritoneal cavity of a rabbit. Death followed within thirty hours, and the diplococcus was recovered by cultural methods from the lungs, spleen, liver, heart's blood, and peritoneal fluid.

Histological examination.—Many of the bronchi (2–5 mm. in diameter) are normal. Others are filled with leucocytes and scattered patches of epithelial cells. In no instance does the wall show evidence of inflammatory change, hence it is likely that the leucocytes seen within the lumina have been derived from distant foci of inflammation.

The bronchioles of less than 1 mm. diameter are filled completely with polymorphonuclear leucocytes and desquamated epithelial cells. In some the epithelial lining is intact, but in the majority only patches of cells remain attached to the tunica propria, the detached cells lying within the lumen, often in long flakes. In others the epithelium is separated *en masse*, forming an isolated tube within the channel. Leucocytes are seen in great numbers between the cells of the attached epithelium. The tunica propria is edematous and greatly infiltrated with leucocytes. The capillaries are engorged, and in size resemble small veins. In many bronchioles these capillaries form the inner lining of the wall. The circular ring of muscle fibers of the bronchial wall is interrupted, and the muscle cells are seen in irregular patches lying among the other tissue elements. The perivascular lymph vessels are greatly dilated. The alveoli immediately surrounding the bronchioles are in many instances filled with leucocytes, epithelial cells, and red blood corpuscles. Those more distant are free from inflammatory products. The blood-vessels of the alveolar walls are intensely engorged.

In order to determine further the relation which the inflammation bears to the bronchioles, serial sections were made from several areas near the surface of the lungs. Sections, 10 μ thick,

were cut, and every third was examined. The study of the series shows that the inflammation extends along the bronchioles and is for the most part confined to them, and the immediately adjacent alveoli, whereas distant alveoli are either unchanged or dilated.

From the foregoing description it is clear that the large bronchi are free from inflammation. The alveolar changes are slight considering the fact that the inflammation had existed for nine days, so that it is evident that the bronchopneumonia must be considered a secondary and not the primary lesion. It is readily seen that the bronchioles are the seat of the infection, and the case must be regarded as one of so-called capillary bronchitis, or preferable bronchiolitis. The inflammation was bilateral, affected all the bronchioles, and extended into the minutest subdivisions. The bacteriological examination showed the diplococcus lanceolatus to be the essential etiological factor—hence the disease must be termed a pneumococcal bronchiolitis.

There have been but few, if any, reports of similar cases with complete examination, but records of clinical cases have been published by P. Duflocq and others.

A point of interest in connection with this case is the fact that during the recent epidemic of lobar pneumonia in Chicago, within a period of six months, according to the report of the Board of Health, over three thousand individuals died from this disease; in the majority of these cases the organism produced, without doubt, a typical pneumonia, whereas in this case it produced a diffuse affection practically free from consolidation. The reason for this great difference is not clear, but perhaps it would be better understood if we knew more definitely the methods by which the pneumococcus attacks the lungs.

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